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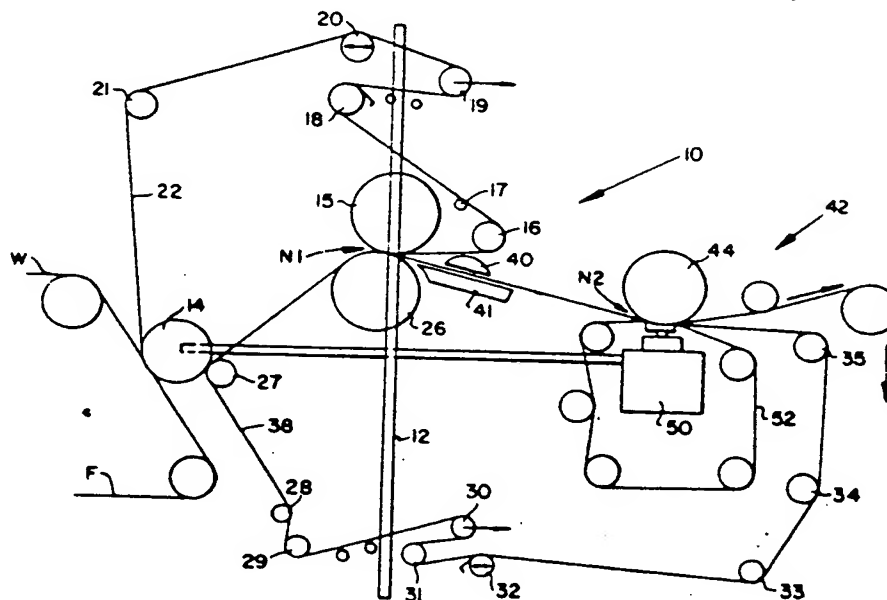
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(54) Title: A PRESS APPARATUS FOR PRESSING A MOVING WEB



(57) Abstract

A press apparatus for pressing a moving web (W) formed on a forming wire (F). The apparatus includes a frame (12) and a first plurality of rolls (14-21) rotatably secured to the frame. A first continuous felt (22) extends around the first plurality of rolls which include a pickup roll (14) disposed adjacent to the wire for transferring the web from the wire onto the first felt. The first plurality of rolls also includes a first press roll (15) which is disposed downstream relative to the pickup roll. A second continuous felt (38) extends around a second plurality of rolls (26-35) with the second felt cooperating with the first felt. The second plurality of rolls includes a second press roll (26) which cooperates with the first press roll for defining therebetween a first nip (N1). The web is urged against the second felt when the web emerges from the first nip and the second felt and supported web pass through a second nip (N2) defined by an extended nip press (42) disposed downstream relative to the first nip.

A PRESS APPARATUS FOR PRESSING A MOVING WEB  
BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to a press apparatus for pressing a moving web formed on a forming wire. More particularly, this invention relates to a press apparatus including a first nip defined by cooperating press rolls and a second nip defined by an extended nip press with a second felt extending through both nips.

INFORMATION DISCLOSURE STATEMENT

In a press section of a papermaking machine, an important object is to remove as much water from the web as possible without damaging the formation, or crushing the web. It is a well-known fact that with every additional removal of even a fraction of a percent of water from the web, great savings in energy are accomplished. The water which is not removed in the press must be removed thermally in the dryer drum section of the paper machine, and the energy requirements for the removal of a unit of water by evaporation greatly exceed the energy requirements for removal of the same unit of water by pressing.

In U.S. patent number 4,561,939 to E. J. Justus, assigned to Beloit Corporation, there is described a first dewatering nip defined by a pair of cooperating press rolls followed by an extended nip press. This patent discloses a pair of lower felts for transporting the formed web between the first and second nip. However, a suction roll or the like, is required in order to transfer the formed web from the first lower felt to the second upper felt prior to the web being transported between the second upper felt and the second lower felt. The web, consequently, is not supported by either of the lower

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felts for a certain portion of the travel between the first and second nips. Also, during suction transfer from one felt to the next, water is transferred back into the sheet from the preceding felt.

The present invention provides means for supporting the web on a lower felt throughout the travel of the web between the first and second nip thereby providing a "no draw press" and eliminating the need for the transfer suction roll of the aforementioned second upper felt of the Justus patent.

Although U.S. patent number 3,023,805 to Walker teaches a single lower felt extending between a first and a second nip, the second nip is not an extended nip press. Furthermore, in an alternative embodiment of the present invention, by the provision of a grooved blanket in the extended nip press, the need for a second upper felt is eliminated.

Therefore, it is a primary objective of the present invention to provide a press apparatus that overcomes the aforementioned inadequacies of the prior art proposals and which provides a press apparatus that contributes a significant improvement to the art of pressing a moving web that has been formed on a forming wire.

Another object of the present invention is the provision of a press apparatus having a first nip defined by a pair of cooperating press rolls and a second nip defined by an extended nip press, the web being supported between these nips by means of a felt which passes through both of these nips.

Another objective of the present invention is the provision of a press apparatus in which the second nip is defined by an extended nip press having a grooved blanket which

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eliminates the need for having double felting of the extended nip press.

Other objects and advantages of the present invention will be apparent to those skilled in the art by a consideration of the following description including the claims taken together with the annexed drawings.

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SUMMARY OF THE INVENTION

The present invention relates to a press apparatus and a method for pressing a moving web formed on a forming wire. The apparatus includes a frame and a first plurality of rolls rotatably secured to the frame. A first continuous felt extends around the first plurality of rolls which includes a first press roll. A second plurality of rolls are rotatably secured to the frame and a second continuous felt extends around the second plurality of rolls with the second felt cooperating with the first felt. The second plurality of rolls includes a second press roll which cooperates with the first press roll for defining therebetween a first nip such that when the web moves towards the first nip, the web is pressed between the first and second felts during passage through the first nip. The web is urged against the second felt when the pressed web emerges from the first nip such that the web is supported by the second felt when the first and second felts diverge relative to each other. An extended nip press means is disposed downstream relative to the first nip for imparting further dewatering to the web when the web supported by the second felt passes through a second nip defined by the extended nip press means.

In one embodiment of the present invention, the extended nip press includes a grooved blanket which eliminates the need for double-felting of the extended nip press because as the grooved blanket, the second felt, and the web supported thereon pass through the second nip, water removed from the web passes through the second felt into the grooves of the blanket.

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In another embodiment of the present invention, the first press roll is a suction roll which serves additionally as a pickup roll thereby resulting in a compact press configuration.

In another embodiment of the present invention, the second press roll is a suction roll for urging the emerging web against the second felt.

In a further embodiment of the present invention, the extended nip press includes a third felt.

The present invention includes many alternative arrangements and modifications which will be apparent to those skilled in the art. The present invention is not limited to the various embodiments described hereinafter which embodiments are merely illustrative of the present invention. Rather, the present invention is defined by the annexed claims which define the scope of the present invention.

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the present invention  
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BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a side elevational view of a press apparatus according to the present invention with the extended nip press having no upper felt.

Figure 2 is a side elevational view of an alternative embodiment of the present invention showing a compact press arrangement.

Figure 3 is a side elevational view of another embodiment of the present invention showing the second press roll as a suction press roll.

Figure 4 is a side elevational view of yet another embodiment of the present invention in which the extended nip press means includes a third felt.

Similar reference numerals refer to similar parts throughout the various embodiments of the present invention.

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DETAILED-DESCRIPTION

Figure 1 shows a press apparatus generally designated 10 for pressing a moving web W formed on a forming wire F. The apparatus 10 includes a frame 12 and a first plurality of rolls 14,15,16,17,18,19,20 and 21. A first continuous felt 22 extends around the first plurality of rolls 14 to 21. The first plurality of rolls 14 to 21 includes a pickup roll 14 which may be a suction roll. The roll 14 is disposed adjacent to the wire F. The pickup roll 14 and wire F cooperate together such that when the web W passes between the wire F and the pickup roll 14, the web W is transferred from the wire F onto the first felt 22. The roll 15 is a first press roll and is disposed downstream relative to the pickup roll 14. A second plurality of rolls 26,27,28,29,30,31, 32,33, 34 and 35 are rotatably secured to the frame 12. A second continuous felt 38 extends around the second plurality of rolls 26 to 35 with the second felt 38 cooperating with the first felt 22 such that the web W is supported by the first and second felts 22 and 38 respectively when the web W moves between the pickup roll 14 and the first press roll 15. The roll 26 is a second press roll which cooperates with the first press roll 15 for defining therebetween a first nip N1 such that when the web W moves from the pickup roll 14 and between the first and second felts 22 and 38 respectively, towards the first nip N1, the web W is pressed between the first and second felts 22 and 38 respectively during passage through the first nip N1.

In the embodiment shown in figure 1, the first or second press rolls 15 and 26 may be grooved, suction or plain rolls or a combination thereof.



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As shown in figure 1, a steam box 40 and suction shoe 41 are disposed on opposite sides of the second felt 38 and web downstream relative to the nip N1 for urging the web W against the second felt 38 when the web emerges from the first nip N1. This arrangement permits the web W to be supported by the second felt 38 when the first and second felts 22 and 28 diverge relative to each other. An extended nip press means generally designated 42 is disposed downstream relative to the first nip N1 for imparting to the web W a further dewatering when the web W supported by the second felt 38 passes through a second nip N2 defined by the extended nip press means 42. The extended nip press means 42 includes a plain roll 44, a shoe 46 having a concave surface 48. Furthermore, the extended nip press includes means 50 for urging the shoe 46 against a grooved blanket 52 such that the second felt 38 is disposed between the blanket 52 and the web W during passage of the blanket, felt and web 52, 38 and W respectively, through the nip N2. The blanket 52 is grooved on the surface disposed adjacent to the felt 38 as fully disclosed in copending International Application No. PCT/US85/01953. All the disclosure of PCT/US85/01953 is incorporated herein by reference.

In an alternative embodiment of the present invention as shown in figure 2, a first felt 22A extends around a first plurality of rolls 14A, 15A, 16A, 17A and 18A. A second felt 38A extends around a second plurality of rolls 26A, 27A, 28A and 29A. The first and second felts 22A and 38A cooperate together at a first nip N1A defined by cooperating first and second press rolls 14A and 26A respectively. As shown in figure 2, the web WA is transferred from the wire FA onto the first felt 22A by

the roll 14A which may be a suction roll. The web WA supported by the first felt 22A is then contacted by the second felt 38A during passage of the web WA through the first nip N1A. The press arrangement of figure 2 provides a compact configuration and the web WA is supported by the second felt 38A during passage of the web WA through both the first nip N1A and a second nip N2A defined by an extended nip press means 42A. The arrangement shown in figure 2 also includes a steam box 40A and a vacuum shoe 41A disposed downstream relative to the first nip N1A for urging the web WA against the second felt 38A when the web WA emerges from the first nip N1A. Furthermore, the rolls 14A and 26A may be suction rolls having regions of high and low suction as shown in figure 2 for transferring the web WA from the wire FA to the felt 22A and for removing the optimal amount of water from the web WA during passage through the first nip N1A.

Figure 3 shows another alternative embodiment of the present invention in which the second press roll is replaced by a suction press roll 26B which urges the web WB emerging from the first nip N1B against the second felt 38B. In the embodiment shown in figure 3, because the roll 26B is a suction roll, the web WB will be urged against the second felt 38B when the felts 22B and 38B diverge relative to each other. Therefore, the steam box 40B and cooperating vacuum box 41B may be disposed nearer to the extended nip press means 42B than to the first nip N1B as the web WB will already be urged against the second felt 38B.

In the embodiment shown in figure 4, the extended nip press means 42C includes a third plurality of rolls 54C, 55C, 56C, 57C, 58C and 59C. A third felt 60C extends around the

rolls 54C<sup>2</sup> to 59C and around third press roll 44C such that the web WC is disposed between the second and third felts 38C and 60C respectively. Such a double felted extended nip press means 42C is particularly advantageous when pressing heavy grade board which offers high flow resistance.

In operation of all four embodiments of the present invention, the formed web is transferred from the forming wire to a first felt by means of a pickup roll which may be a suction roll. The web is led towards a first nip which is defined by a first and second press roll such that a portion of the water within the web is removed from the web at the first nip. The first and second felts diverge relative to each other after emerging from the first nip and a steam box and cooperating vacuum shoe is used to urge the web emerging from the nip against the second felt.

More specifically, in the first embodiment, the steam box 40 and cooperating vacuum shoe 41 are disposed close to the first nip N1 so that the web is urged against the second felt 38.

The second embodiment operates such that the first press roll 14A not only serves as a pickup roll, but also as a press roll thereby providing a more compact press configuration and a reduction in components.

In operation of the third embodiment as shown in figure 3, the second press roll 26B is a suction roll, therefore the steam box 40B and vacuum box 41B are positioned further downstream nearer to the extended nip press means 42B. In all of the embodiments of figures 1 through 3, the extended nip press means incorporates a grooved blanket thereby avoiding the necessity for a third felt.

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In operation of the embodiment of figure 4, the extended nip press means 42C includes a third felt 60C so that a high flow resistant web may be pressed and adequately dewatered.

The present invention greatly simplifies and reduces the cost of providing a dewatering press by eliminating the need for any transfer rolls for transferring the web between adjacent lower felts between the first and second nips. Also, the arrangement avoids the additional cost of providing two lower felts between the first and second nips. Additionally, the problem of rewetting during transfer of the web to a second lower felt is inhibited and difficulties experienced with the prior open draw arrangements are avoided. Furthermore, by utilizing a grooved blanket, the necessity for an upper felt for the extended nip press is eliminated.

Although, in the past, it may have appeared unviable to use a single lower felt for running through the first nip and then through an extended nip press because generally it was considered that such an arrangement would cause overloading of the lower felt, the foregoing arrangement has been found to operate extremely satisfactorily.

Other advantages and benefits to be derived from the foregoing arrangement will be readily apparent to those skilled in the art and the present invention encompasses many variations and modifications which fall within the spirit and scope of the present invention as defined by the appended claims.

What is claimed is:

1. A press apparatus for pressing a moving web formed on a forming wire, said apparatus comprising:

a frame;

a first plurality of rolls rotatably secured to said frame;

a first continuous felt extending around said first plurality of rolls;

said first plurality of rolls including:

a first press roll;

a second plurality of rolls rotatably secured to said frame;

a second continuous felt extending around said second plurality of rolls;

said second plurality of rolls including:

a second press roll cooperating with said first press roll for defining therebetween, a first nip such that the web is pressed between said first and second felts during passage through said first nip;

means for urging the web against said second felt when the pressed web emerges from said first nip such that the web is supported by said second felt when said first and second felts diverge relative to each other; and

an extended nip press means disposed downstream relative to said first nip for imparting to the web a further dewatering when the web supported by said second felt passes through

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a second nip defined by said extended press means.

2. A press apparatus as set forth in claim 1 wherein said first press roll is a grooved roll.
3. A press apparatus as set forth in claim 1 wherein said first press roll is a plain roll.
4. A press apparatus as set forth in claim 1 wherein said first plurality of rolls further includes:  
a pickup roll disposed adjacent to the wire, said pickup roll and wire cooperating together such that when the web passes between the wire and the pickup roll, the web is transferred from the wire onto said first felt;  
said first press roll being disposed downstream relative to said pickup roll such that when the web moves from said pickup roll, the web is pressed between said first and second felts during passage through said first nip.
5. A press apparatus as set forth in claim 4 wherein said first and second felts support the web along the entire distance between said pickup roll and said first nip.
6. A press apparatus as set forth in claim 1 wherein said first press roll is a pickup roll for transferring the web from the wire to said first felt.
7. A press apparatus as set forth in claim 1 wherein said second press roll is a grooved roll.
8. A press apparatus as set forth in claim 7 wherein said means for urging the web against said second felt

is a steam box and cooperating suction shoe disposed downstream relative to said first nip such that when the web emerges from said first nip, the web is urged by said steam box and said suction shoe toward said second felt and away from said first felt.

9. A press apparatus as set forth in claim 1 wherein said means for urging the web against said second felt includes:
  - suction means disposed within said second press roll for applying suction through said second felt when the web is passing through said first nip for urging the web toward said second felt when the web emerges from said first nip.
10. A press apparatus as set forth in claim 1 wherein said extended nip press means includes:
  - a third press roll;
  - a shoe defining a concave surface such that said concave surface cooperates with said third press roll for defining therebetween said second nip;
  - means for urging said shoe toward said third press roll;
  - a continuous blanket extending through said second nip such that when said blanket, said second felt and the web pass through said second nip, said second felt is disposed between said blanket and the web.
11. A press apparatus as set forth in claim 10 wherein said third press roll is vented.
12. A press apparatus as set forth in claim 10 wherein said extended nip press means further includes:

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a third plurality of rolls rotatably secured to said frame;

a third continuous felt extending around said third

plurality of rolls, said third felt together with said blanket, said second felt and the web passing through said second nip such that the third felt is disposed between the web and said third press roll.

13. A press apparatus as set forth in claim 10 wherein said blanket has a surface which is pressed against said second felt during passage of said blanket and said second felt through said second nip, said surface being vented for the reception therein of water removed from the web when the web passes through said second nip.

14. A press apparatus for pressing a moving web formed on a forming wire, said apparatus comprising:

a frame;

a first plurality of rolls rotatably secured to said frame;

a first continuous felt extending around said first plurality of rolls;

said first plurality of rolls including:

a pickup roll disposed adjacent to the wire, said pickup roll and wire cooperating together such that when the web passes between the wire and the pickup roll, the web is transferred from the wire onto said first felt;

a first press roll disposed downstream relative to said pickup roll;



because videoposter 2/10-16-  
a second plurality of rolls rotatably secured to said frame;

a second continuous felt extending around said second plurality of rolls;

said second felt cooperating with said first felt such that the web is supported by said first and second felts when the web moves between said pickup roll and said first press roll;

said second plurality of rolls including:

a suction press roll cooperating with said first press roll for defining therebetween, a first nip such that when the web moves from said pickup roll and between said first and second felts toward said first nip, the web is pressed between said first and second felts during passage of the web through said first nip; and

an extended nip press means disposed downstream relative to said first nip for imparting to the web a further dewatering when the web supported by said second felt passes through a second nip defined by said extended nip press means.

15. A press apparatus for pressing a moving web formed on a forming wire, said apparatus comprising:

a frame;

a first plurality of rolls rotatably secured to said frame;

a first continuous felt extending around said first plurality of rolls;

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said first plurality of rolls including:

a pickup roll disposed adjacent to the wire, said

pickup roll and wire cooperating together  
such that when the web passes between the  
wire and the pickup roll, the web is trans-  
ferred from the wire onto said first felt;

a first press roll disposed downstream relative to  
said pickup roll;

a second plurality of rolls rotatably secured to said  
frame;

a second continuous felt extending around said second  
plurality of rolls;

said second felt cooperating with said first felt such  
that the web is supported by said first and second  
felts when the web moves between said pickup roll  
and said first press roll;

said second plurality of rolls including:

a second press roll cooperating with said first  
press roll for defining therebetween, a first  
nip such that when the web moves from said  
pickup roll and between said first and second  
felts toward said first nip, the web is pressed  
between said first and second felts during  
passage through said first nip;

means for urging the web against said second felt when  
the pressed web emerges from said first nip such  
that the web is supported by said second felt when  
said first and second felts diverge relative to  
each other;

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an extended nip press means disposed downstream relative to said first nip for imparting further dewatering

of the web when the web supported by said second felt passes through a second nip defined by said extended nip press means;

said extended nip press means including:

a third press roll;

a shoe defining a concave surface such that

said concave surface cooperates with

said third press roll for defining there-between said second nip;

means for urging said shoe towards said third press roll;

a continuous blanket extending through said second nip such that when said blanket, said second felt and the web pass through said second nip, said second felt is disposed between said blanket and the web;

a third plurality of rolls rotatably secured to said frame;

a third continuous felt extending around said third plurality of rolls, said third felt together with said blanket, said second felt and the web passing through said second nip such that the third felt is disposed between the web and said third press roll; and

said blanket having a surface which is pressed against said second felt during passage of said blanket and second felt through said

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second nip, said surface defining a plurality of grooves for the reception therein of water removed from the web when the web passes through said second nip.

16. A method of pressing a moving web which has been formed on a forming wire, the method comprising the steps of:

transferring the formed web from the forming wire to a first continuous felt;

transporting the formed web between the first felt and a cooperating second felt.

leading the formed web disposed between the first and second felts towards a first nip defined by a first and second press roll;

pressing the formed web between the cooperating press rolls for removing a portion of water from the formed web;

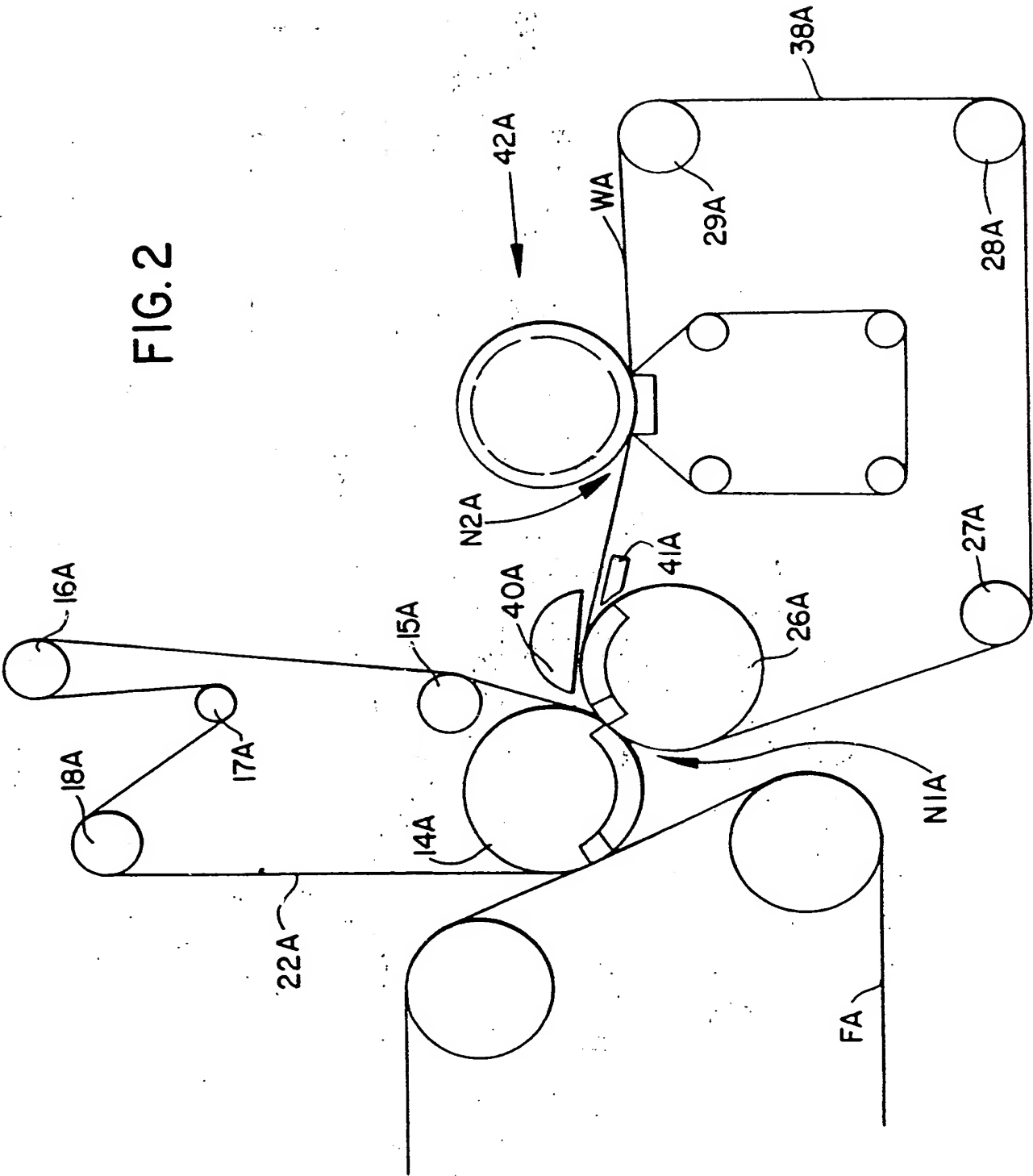
urging the formed web emerging from the first nip against the second felt;

conducting the formed web supported on the second felt towards a second nip defined by an extended nip press; and

pressing the second felt and web supported thereon as the web and second felt pass together through the second nip for imparting to the web a further dewatering.



FIG. 2



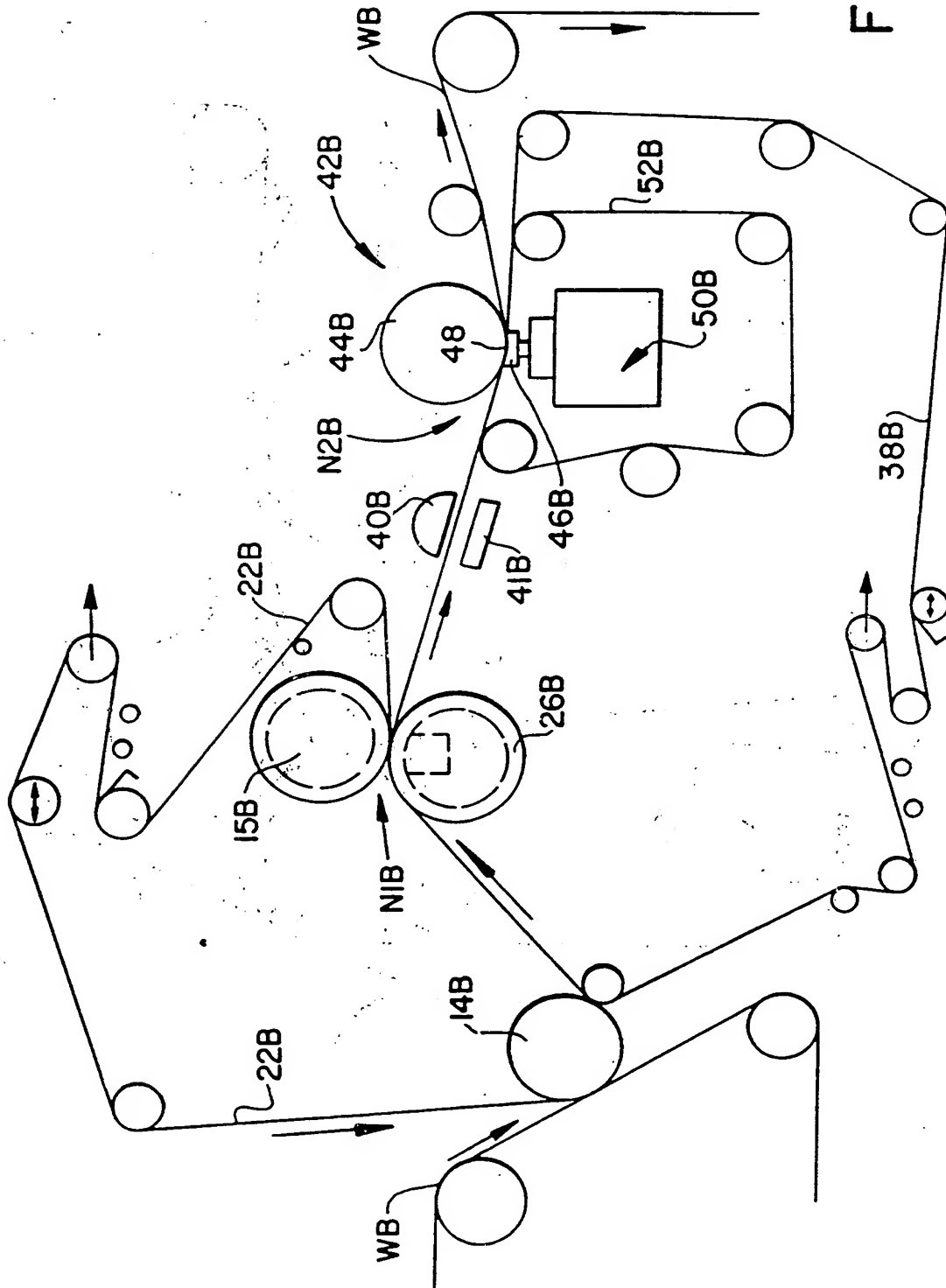
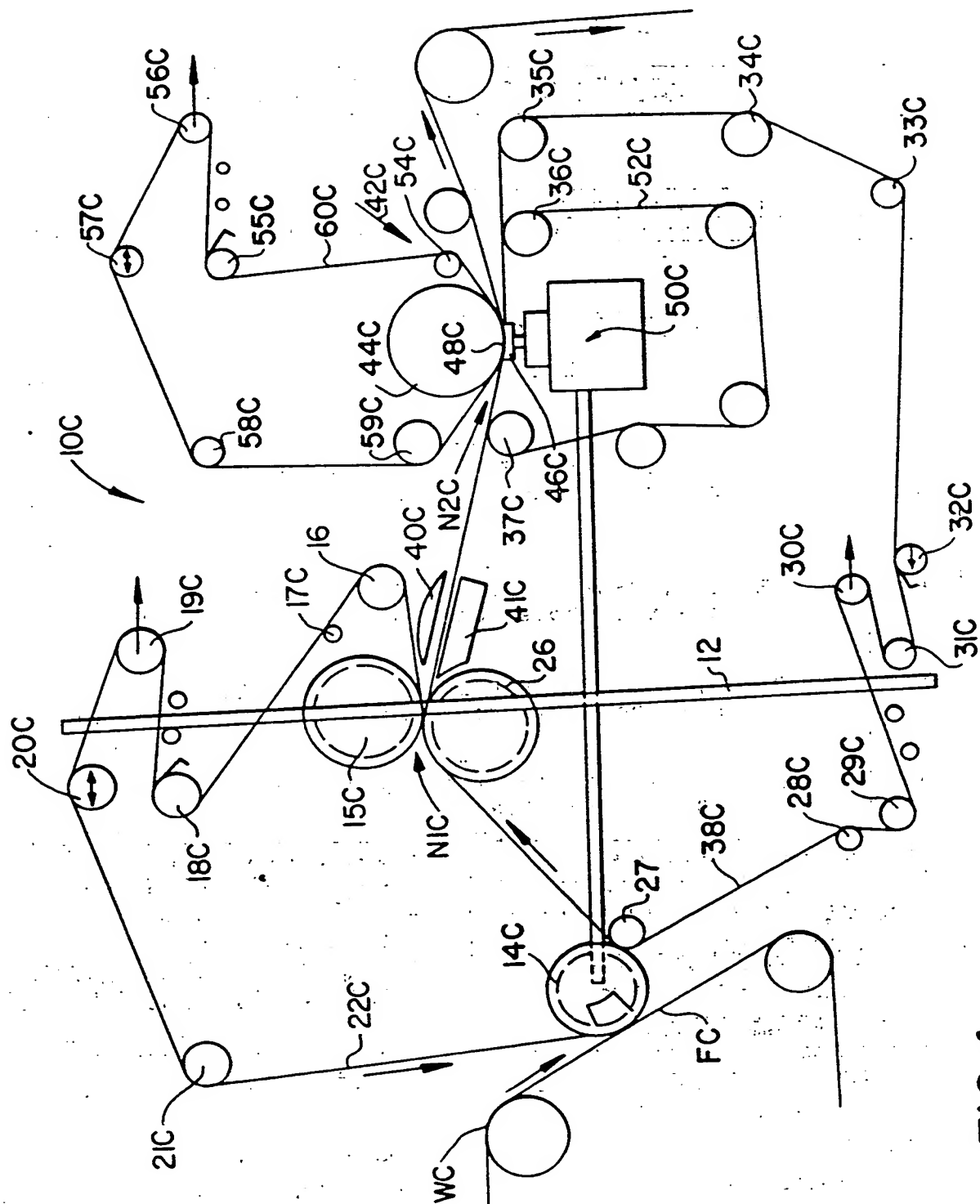


FIG. 3




SUBSTITUTE SHEET



# INTERNATIONAL SEARCH REPORT

PCT/US 86/00961

International Application No.

<b>I. CLASSIFICATION OF SUBJECT MATTER</b> (if several classification symbols apply, indicate all) *		
According to International Patent Classification (IPC) or to both National Classification and IPC		
IPC <sup>4</sup> :	D 21 F 3/04	
<b>II. FIELDS SEARCHED</b>		
Minimum Documentation Searched *		
Classification System	Classification Symbols	
IPC <sup>4</sup>	D 21 F	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched *		
<b>III. DOCUMENTS CONSIDERED TO BE RELEVANT *</b>		
Category *	Citation of Document, <sup>11</sup> with indication, where appropriate, of the relevant passages <sup>12</sup>	Relevant to Claim No. <sup>13</sup>
X	DE, A, 3515576 (VALMET OY) 28 November 1985 see the whole document	1, 2, 4, 7, 9-12, 16 8, 14, 15
A		
X	EP, A, 0107606 (BELOIT) 2 May 1984 see the whole document	1-4, 7, 9, 14, 16 10, 15
A		
A	DE, B, 1108060 (BELOIT) 31 May 1961 see the whole document	1, 3, 4, 9, 14-16
A	DE, B, 1036624 (BELOIT) 14 August 1958 see the whole document	1, 4, 5, 9, 14-16
A	FR, A, 2384890 (OY WILH. SCHAUMAN) 20 October 1978 see the whole document	1, 6, 14-16
<div style="display: flex; justify-content: space-between;"> <div style="width: 48%;"> <p>* Special categories of cited documents: <sup>10</sup></p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> </div> <div style="width: 48%;"> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</p> <p>"&amp;" document member of the same patent family</p> </div> </div>		
<b>IV. CERTIFICATION</b>		
Date of the Actual Completion of the International Search		Date of Mailing of this International Search Report
10th December 1986		22 JAN 1987
International Searching Authority		Signature of Authorized Officer
EUROPEAN PATENT OFFICE		M. VAN MOL 

## III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
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A	US, A, 4482430 (OY TAMPELLA) 13 November 1984 see the whole document	10-13,15

## ANNEX TO THE INTERNATIONAL SEARCH REPORT ON

INTERNATIONAL APPLICATION NO. PCT/US 86/00961 (SA 13421)

This Annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the European Patent Office EDP file on 05/01/87

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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US-A- 4482430	13/11/84	None	

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